5/19/38

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MATSUCOCCUS STUDIES

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FLAGGING OF ARTIFICIALLY INFESTED TREES IN THE WOLF CREEK PLOT I

Plot Set-up

During the spring of 1937, 15 black jacks were artificially infested with Matsucoccus sp. scale to further demonstrate the implication of insects and flagging. The experimental trees are situated in a 3 acre plot in the Wolf Creek area which is, and has been, considered relatively free of flags and scale. The experimental trees involved fall into the following crown classes: dominant (2 trees); co-dominant (1); intermediate (2); suppressed (2); and the X or orchard type (8). In general the trees are very thrifty. The site is fair and the area is rather an open one. Attached map (figure 1) of the plot shows distribution of the trees.

Scale Collections and Infestation

Scale collections were made from the Lynx Creek area on the Prescott National Forest, and the Baker Butte area on the Coconino. Both places have been considered heavily flagged areas. Adult females with egg sacs and eggs were selectively collected from flagged trees and introduced to twigs on the experimental trees by two methods. The first method consisted of placing each adult female on the twig by means of a small camel's hair brush, and the second by placing scale still intact with the node into small thimble-shaped copper screen baskets and fastening these securely on the twig by means of a fine copper wire. In general the scale were placed on the first, second and third nodes.

Flagging

During February 1937, 9 months after infestation, the first flag appeared on tree D, and paling of the needles was observed on one branch

on tree A (see map of plot). The period following was marked with a progressive paling which apparently reached a peak around the latter part of April. It is interesting to note that flagging on these experimental trees coincided to a marked degree with flagging in the Prescott Forest. Non-infested twigs on the experimental trees, check trees with empty copper screen baskets (see map), and non-infested trees in the plot show no signs of flagging. The experimental trees have been checked periodically during the time of flagging thus far.

Discussion

It was observed during the periodical check-ups of the flagging that a heavy population density of Matsucoccus scale existed on flagged twigs. Further observations revealed a relatively light or no scale establishment on other artificially infested twigs. As a consequence, a more thorough determination of scale population density on flagged and green twigs was made. Since it has been demonstrated by preadult population counts (see report by J. M. Miller and H. L. McKenzie of December 20, 1937, p. 3, para. 3) that the largest number of insects occur on the second years growth, it was decided to use this as an indices for these determinations. It was found impractical to make scale counts on twigs on the experimental trees since this would necessitate removal of such for microscope examinations. Therefore a quantitative scale was arbitrarily established, viz: heavy, medium, light and none. It foregoes to say the branch with the heaviest infestation was taken as a standard for a heavy population, etc. Conservativeness was practiced in all readings.

Consideration of Tables and Figrues

Table 1 shows the basic data of experimental trees. Much of

the data is self explanatory. However, attention is invited to the column number 3 - date of infestation. It is interesting to note that the experimental trees through H infested during the earlier part of the season resulted in a conspicuous degree of flagging, while flagging on the remaining trees was nil. Apparently this is due to the fact that the majority of Matsucoccus scale eggs were hatched duringthe latter part of May 1937. Column 5 in table 1 shows twigs grouped according to scale population density determinations, and column 6 shows the flags occurring to date in the same grouping. It is readily observed that those twigs falling in the heavy and medium groups invaribly show a high percentage of flagging while those in the light and none groups show no flagging. Trees I to O are particularly interesting in the latter respect. Although there is not a flagging of 100 percent in the heavy and medium infested twigs, the obvious trends shown in this table are too significant to ignore. The question also arises as to whether it is reasonable to expect a 100 percent kill? Furthermore it must be remembered that the flagging period is not yet over. The map (figure 1) shows graphically the twigs flagged on the experimental trees. Degree of yellow denotes percent of twigs flagged.

Another method of determining the importance of the scale population density to flagging was decided upon. This consisted of clipping green and flagged twigs at random for laboratory microscopic examinations. Counts were carefully made under the binocular microscope by William C. Reeves. Table 2 shows the averaged results. It will be noted in this table that twigs ofthe same 1936 internode dimensions were directly compared so as to obtain a fair sample. Since the majority of

the scale settle under the bract enclosing the needle base, it has been observed that many of the preadult bodies on the flagged twigs had sloughed off due to the shedding of the dying needles as well as in the handling of the dried twigs for these experimental counts. This was not observed in the case of the green twigs. The values presented in this table mark the first of an extended study just begun. Figure 2 presents graphically this data. The data shown in table 1 becomes more and more significant with the compilation ofthese random counts of Matsucoccus sp. scale on flagged and green twigs as they occur in nature.

It is a recognized fact that cell necrosis invariably occurs where there is an aggregation of feeding scale (see report of December 20, 1937, p. 3-4.). While it has not been definitely proven by histological studies now under way that coalescing of these necrotic areas eventually kills the twigs; still it is reasonable to assume that this hypothesis is substantiated still further by the data presented in this report, viz; flagging occurs on twigs bearing high populations of Matsucoccus scale.

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May 19, 1938

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FLAG - MATSUCOCCUS POPULATION DENSITY CORRELATIONS

Tree No.	No. Twigs Infested	Date of Infestation	Method of Introduction	Twigs Grouped According To: Population Density Correlations: Heavy	Medium	Light	None	Flags Occuring To Date Grouped According To Population Density Determinations: Heavy No.	Heavy %	Medium No.	Medium %	Light No.	Light %	None No.	None %	Total No.	Total %
A	10	May 3,1937	Camelshair Brsh	5	2	3	0	3	60.0	0	0	0	0	0	0	3	30.0
B	10	May 6, 1937	" "	0	2	7	1	0	0	0	0	0	0	0	0	0	0
C	10	May 11,1937	" "	6	2	1	1	6	100	1	50.0	0	0	0	0	7	70.0
D	10	May 14,1937	" "	2	4	4	0	2	100	3	75.0	0	0	0	0	5	50.0
E	10	May 17,1937	Copper Baskets	0	1	0	9	0	0	1	100	0	0	0	0	1	10.0
F	10	May 19,1937	" "	0	0	0	10	0	0	0	0	0	0	0	0	0	0
G	10	May 19,1937	" "	7	3	0	0	4	57.1	0	0	0	0	0	0	4	40.0
H	10	May 20,1937	" "	10	0	0	0	9	90.0	0	0	0	0	0	0	9	90.0
I	10	May 21,1937	" "	0	0	0	10	0	0	0	0	0	0	0	0	0	0
J	10	May 21,1937	" "	0	0	0	10	0	0	0	0	0	0	0	0	0	0
K	10	May 21,1937	" "	0	0	0	10	0	0	0	0	0	0	0	0	0	0
L	10	May 21,1937	" "	0	0	0	10	0	0	0	0	0	0	0	0	0	0
M	10	Jne 17,1937	Camelshair Brsh	0	0	3	7	0	0	0	0	0	0	0	0	0	0
N	10	Jne 17,1937	" "	0	0	0	10	0	0	0	0	0	0	0	0	0	0
O	10	Jne 21,1937	" "	0	0	0	10	0	0	0	0	0	0	0	0	0	0
Totals 15	150		7-Cmlshair Brsh; 8-Copper Bskets	30	14	18	88	24	80.0	5	35.7	0	0	0	0	29	19.3

Table 1.

MATSUCOCCUS POPULATION
RANDOM COUNT

Area--- Lynx Creek

Grouped By 1936 Internode Length Classes

Approximate Average Length Class (Inches)	Approximate Average Diameter (Inches)	No Of Twigs Involved	Average 1936 Internode Population Count	
			Green	Flagged
1.25	.25	2		15
2.5	.25	1	9	
2.0	.25	5		22.4
3.0	.26	6	11.8	
3.0	.26	8		30.8
4.0	.28	6	14.1	
4.0	.50	1		24.0
5.0	.38	2	24.5	
5.0	.50	1		30.0
8.0	.50	2	30.5	
Total No.Twigs- - - - -Green- 17				
Flagged- 17				
34				
Average of Population Totals From Work Sheets- - - - - - - - - - - -			16.2	26.0

Note: Length Classes include .5 plus and minus for any inch; i.e., the 2" Class would include all values from 1.6 to 2.5.

Table 2.

CORRELATION OF MATSUCOCCUS POPULATION
COUNTS ON GREEN AND FLAGGED TWIGS

LEGEND

Green Twigs_____(17)
Flagged Twigs- - - - (17)

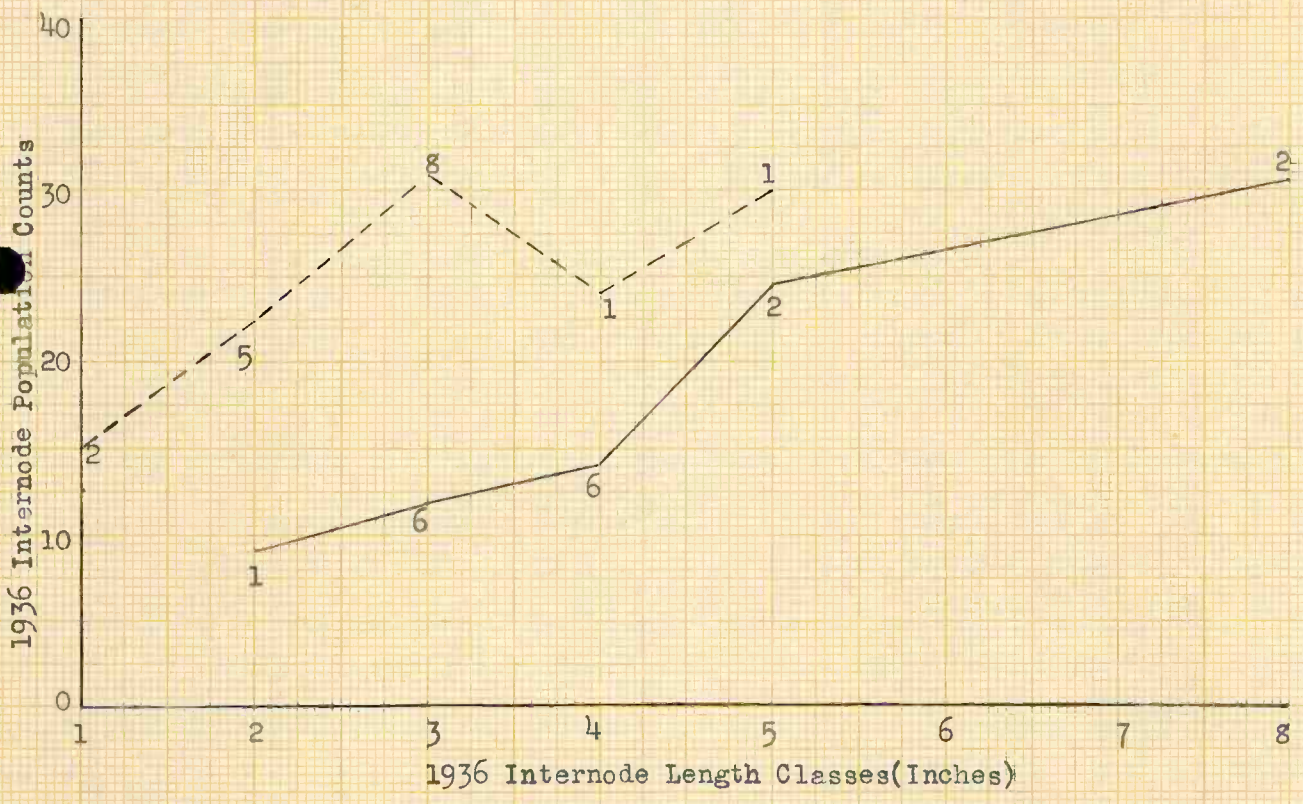
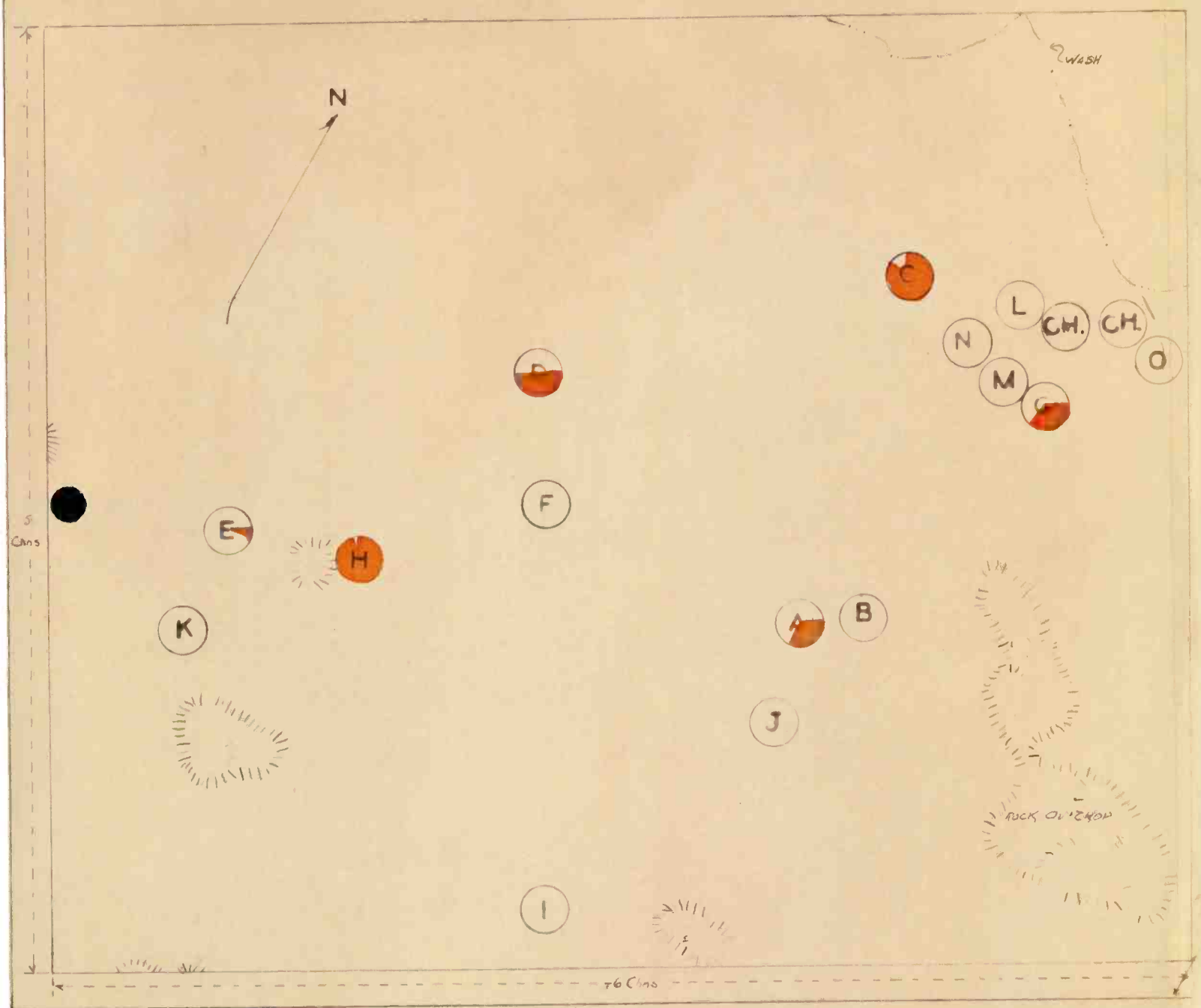


Figure 2.

MATSUCOCCUS STUDIES

WOLF CREEK AREA

PLOT NO.- 1



ACRES - 3.0

SCALE - 1. IN.= 50 FT.

● - indicates percent of flags.

Figure 1